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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/993,503	11/27/2001	Hoi-Sik Moon	6192.0193.AA	8146

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EXAMINER

NGUYEN, HOAN C

ART UNIT	PAPER NUMBER
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2871

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	12/26/2006	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

09/993,503

Applicant(s)

MOON, HOI-SIK

Examiner

HOAN C. NGUYEN

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 November 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15, 17-19 and 21-24 is/are pending in the application.
- 4a) Of the above claim(s) 1-14 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 15, 17-19 and 21-24 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10/06/2006 has been entered.

Supplemental Response has filed on 11/13/2006 with marked the changes in the amended claims.

Claims 1-14 are withdrawn. Claims 16, 20 are cancelled. Claims 15, 17-19 and 21-24 are elected.

The amended specification raises a following objection of specification.

Specification

The disclosure is objected to under 37 CFR 1.71, as being so incomprehensible as to preclude a reasonable search of the prior art by the examiner. For example, the following items are not understood:

- (a) The equations 2 and 3 have amended with the TCP expanded interval of α with unit of length, which was defined in equation 1 as a thermal expansion

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coefficient of the PCB with unit of 1/temperature. **The same symbol α used for two different features, thus it is unclear.**

(b) The equation 2 is inconsistent with Fig. 5B. As the equation 2, $A_1 = -P_1 + \alpha$ thus $P_1 = -A_1 + \alpha$. Fig. 5B shows $P_1 > A_1 + \alpha$.

(c) From page 28 line 14 to page 29 line 3, the specification discloses

"Referring to FIG. 5A, the expansion direction of the first TCP 200a is identical to the expansion direction of the shrinkage printed circuit board 100. However, the expansion direction of the eight TCP 200h is opposite to the expansion direction of the shrinkage printed circuit board 100".

This statement is incorrect. Figs. 5A-C show that the expansion direction on the left edge of the TCP is identical to the expansion direction of the shrinkage printed circuit board 100 (Fig. B); and the expansion direction on the right edge of the TCP is opposite to the expansion direction of the shrinkage printed circuit board 100 (Fig. C).

(d) Applicants fail to point out the significant differences between the conventional PCB and the shrinkage PCB. The conventional PCB and the shrinkage PCB both have thermal expansion. The specification discloses:

The reason is that the thermal reaction properties in the left and the right portions of the printed circuit board are different from each other since the conventional printed circuit board is not symmetric in left and right (page 19 lines 3-6).

Thus, so the shrinkage printed circuit board 100 has the shrunk dimension by the length of about 112.5 μm in comparison with the conventional printed circuit board (page 20 lines 6-8).

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What does “the shrink dimension by the length of about 112.5 μm ” solve the non-symmetry of the conventional printed circuit board?

Also, the thermal expansion amount of the left portion of the shrinkage printed circuit board 100 is larger than the thermal expansion amount of the right portion of the shrinkage printed circuit board 100 depending on the shape of the shrinkage printed circuit board 100 so that the distances among the PCB lands are set as 19 μm in the left portion of the point M and 13 μm in the right portion of the point M (page 20 lines 9-13).

What does “the thermal expansion amount of the left portion of the shrinkage printed circuit board 100 is larger than the thermal expansion amount of the right portion of the shrinkage printed circuit board 100” solve the asymmetry of the conventional printed circuit board? Will the shrinkage printed circuit board become more symmetric?

Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 15, 17-19, 21-24 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to

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reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

There is nowhere in a specification discloses:

Claim 15:

- forming a first conductive pattern group on the printed circuit board in accordance with the thermal expansion properties of the printed circuit board such that intervals between ones of the first conductive pattern group are **smaller** than intervals between ones of a corresponding tape carrier packages.

Claim 19:

- a plurality of printed circuit board land groups formed on the substrate, each one of the printed circuit board land groups corresponding one-to-one with one of the tape carrier packages, an interval between the printed circuit board land groups being **smaller** than an interval between tape carrier packages.

Claim 23:

- forming printed circuit board land groups that correspond one-to-one with each of tape carrier packages on a substrate such that an interval between the printed circuit board land groups is **smaller** than an interval between tape carrier packages.

Therefore, these features in claims 15, 19 and 23 consider as New Subject Matter.

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In response, applicants admits that the specification describes:

The PCB land group 120 is composed of a plurality of PCB lands 120a to 120h and each PCB land 120a and 120h is shrunk by a predetermined dimension (hereafter, it is called the shrinkage design) in the direction of a point M driving the substrate 110 into two parts along the length of the substrate 110" (Page 16, lines 10-13).

This case, each TCP 220a to 200h is formed by a predetermined interval (between TCP, not between second conductive pattern group or connection ports) to align in the position before each PCB 120a to 120h corresponding to the TCP 200a to 200h is shrunk" (page 21, line 14 to page 22, line 2).

Furthermore, the specification also describes:

In the shrinkage printed circuit board 100 having the above-described construction, the input lead 230 of the TCP 200a through 200h is covered with the ACF 130 of the shrinkage printed circuit board 100 by utilizing a movable stage and a fixing member. At that time, the center of each PCB land 120a through 120h is deviated from the center of each TCP 200a through 200h by the shrinkage amount of each PCB land 120a through 120h, thereby forming a pre-compression state (page 22 lines 6-11).

Also, as will be described below, the thermal expansion amounts of the tape carrier packages can be presumed to have constant values concerning the shrinkage printed circuit board 100 or the conventional printed circuit board during the thermo-compression bonding process (page 26 lines 6-9).

As shown in Table 3, the average value of each thermal expansion amount of each TCP is about 37.3 pm (the standard deviation is 2) when the shrinkage printed circuit board 100 is thermo-compressed. Also, as shown in Table 5, the average value of each thermal expansion amount of each TCP is about 42.17pm (the standard deviation is 0.988) when the conventional printed circuit board is thermo-compressed.

When the pre-compression process is performed concerning the first TCP 200a and the first PCB land 120a, the left end of the first PCB land 120a moves toward a first dotted line 420 due to the thermal expansion of the substrate 100 and the left portion of the first TCP 200a also moves toward the second dotted line 520 for the same reason. Hence, after the thermo-compression bonding process, the first TCP 200a is expanded by an interval α between the second real line 510 and the second dotted line 520. Also, the first PCB land 120a expands by an interval (P1) between the first real line 410 and the first dotted line 420. Then, the measured misalignment value becomes the interval (A1) from the second dotted line 520 to the first dotted line 420 (page 28 line 12 to page 29 line 6).

When the pre-compression process is performed concerning the eighth TCP 200h and the eighth PCB land 120h, the left end of the eighth PCB land 120h moves toward the first dotted line 620 due to the thermal expansion of the substrate 100 and the left portion of the eighth TCP 200h also moves toward the second dotted line 720 due to the thermal expansion of the substrate 100. Hence, after the thermo-compression bonding process, the eighth TCP 200h is expanded by an interval α between the second real line 710 and the second dotted line 720. The eighth PCB land 120h also expands by an interval (P8) between the first real line 610 and the first dotted line 620. Also, the measured

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misalignment value becomes the interval (A8) from the second dotted line 720 to the first dotted line 620 (page 30 line 6 to page 31 line 4).

FIGs. 7A and 7B are plane views showing the relative position between the PCB land and the TCP concerning Sample 1 in Table 2 after the thermo-compression bonding process (page 36 lines 8-9).

In Table 2, the misalignment amount is measured on the basis of each edge of TCP 200a through 200h for the convenience of the measurement. However, the precise misalignment amount should be measured on the basis of each PCB land 120a through 120h and the center of each lead of TCP 200a through 200h because the misalignment means the irregularity among conductive patterns for exchanging the electrical signals between the printed circuit board and the tape carrier package (there is no feature in claims 15, 19 and 23).

Therefore, after the widths of each PCB land 120a through 120h and each TCP lead 200a through 200h are measured, the calculated misalignment values on the basis of the center of each TCP lead 200a through 200h are presented in Table 7. In the samples of shrinkage printed circuit board, the measured width of each PCB land 120a to 120h and the measured width of each TCP lead 200a to 200h are shown in the following Table 6 (page 49 line 5 to page 50 line 2).

Examiner looks over the specification but this invention illustrates the differences of the thermal expansions of PCB and TCP, **NOT** "interval between the printed circuit board land groups" or "interval between tape carrier packages land groups" cited in claims 15, 19 and 23.

In conclusion, claims 15, 19 and 23 are rejected due to having new subject matter, therefore, claims 17-18, 21-22 and 24 are rejected since they depend on the infinite claims.

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In the event that the applicants argue that the above 112, 1st paragraph rejection is inappropriate because the invention is inherent in the disclosure, the following rejection in view of admitted prior art are appropriate:

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 15, 17-19, 21 and 22-23 are rejected under 35 U.S.C. 102(b) as being anticipated by the conventional art admitted by applicants.

The conventional arts (Tables 1, 4-5, 8-9, 11 and Figs. 1, 2 4, 8, 10-11) disclose a method for manufacturing a bonded adherent member and printed circuit board comprising

Claim 15:

- forming a first conductive pattern group on the printed circuit board in accordance with the thermal expansion properties of the printed circuit board such that intervals between ones of the first conductive pattern group are smaller than intervals between ones of a corresponding tape carrier packages;
- thermocompression bonding the adherent member and the printed circuit board;

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- during the thermocompression bonding, allowing the printed circuit board to expand such that the first conductive pattern group is substantially aligned with second conductive pattern group on tape carrier packages.

Wherein

Claim 17:

- inherently before said forming, measuring the thermal expansion properties of the printed circuit board.

Claim 18:

- the intervals between ones of the first conductive pattern group are asymmetric when the printed circuit board is asymmetric.

The conventional arts (Tables 1, 4-5, 8-9, 11 and Figs. 1, 2 4, 8, 10-11) disclose a printed circuit board that is to be electrically connected to an external device through a plurality of connection ports spaced apart part from each other, the printed circuit board comprising:

Claim 19:

- a substrate; and
- a plurality of printed circuit board land groups formed on the substrate, each one of the printed circuit board land groups corresponding one-to-one with one of the tape carrier packages, an interval between the printed circuit board land groups being smaller than an interval between the tape carrier packages (to able to electrical connection each one of the printed circuit board land groups must corresponds one-to-one with one of the tape carrier packages).

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Claim 21:

- the interval between the printed circuit board land groups becomes substantially same as the interval of the one of the printed circuit board land groups corresponding one-to-one with one of the tape carrier packages by thermal expansion when the printed circuit board undergoes a thermo-compression bonding process.

Claim 22:

- the intervals between ones of the first conductive pattern group are asymmetric when the printed circuit board is asymmetric.

In regard to claim 23, The conventional arts (Tables 1, 4-5, 8-9, 11 and Figs. 1, 2 4, 8, 10-11) disclose a method of manufacturing a printed circuit board that is to be electrically connected to an external device through a plurality of connection ports spaced apart from each other, comprising:

- forming printed circuit board land groups that correspond one-to-one with each of the one of the printed circuit board land groups corresponding one-to-one with one of the tape carrier packages of the external device on a substrate such that an interval between the printed circuit board land groups is smaller than an interval between the one of the printed circuit board land groups corresponding one-to-one with one of the tape carrier packages.

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Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to HOAN C. NGUYEN whose telephone number is (571) 272-2296. The examiner can normally be reached on MONDAY-THURSDAY:8:00AM-4:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Nelms can be reached on (571) 272-1787. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

HOAN C. NGUYEN
Examiner
Art Unit 2871

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ANDREW SCHECHTER
PRIMARY EXAMINER